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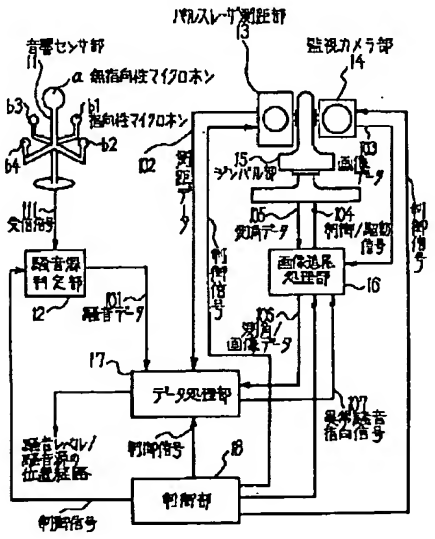
(71) Applicant: NEC CORP
NEC AEROSPACE SYST LTD
(72) Inventor: KAMEYAMA TAKAHARU
MURAI RYUICHI

(54) NOISE MONITORING SYSTEM FOR MOBILE

(57) Abstract:

PURPOSE: To allow highly accurate automatic acquisition of basic data required for noise reduction by tracking a mobile automatically and recording temporal variation of noise level and noise source position.

CONSTITUTION: An acoustic sensor section 11 and a noise source deciding section 12 determine the direction and the level of noise coming from an aircraft entering into an airport and outputs a noise data 101. A pulse laser distance measuring section 13 and a monitor camera section 14 are mounted on a gimbal section 15 with the optical axis being set in parallel and the monitor camera section 14 outputs an image data 103 of a mobile noise source. An image tracking/processing section 16 receives the image data 103 and the monitor camera section 14 tracks the mobile noise source automatically to attain an angle measurement data 105 whereas the pulse laser distance measuring section 13 is interlocked with the monitor camera section 14 to attain a distance measurement data 102. The acoustic sensor section 11 and the noise source deciding section 12 determine the direction and the level of incoming noise and a data processing section 17 obtains a time series data of the position and the level of noise from the acquired data.



[0013]

Fig. 1 is a block diagram showing the composition of one embodiment of this invention.

[0014]

The mobile noise supervising system of this example makes an example the case where the airplane which advances into an airport for landing is made into the mobile source of noise.

Acoustic sensor part 11 and source-of-noise judgment part 12 which constitute the noise data output means which judges the arrival direction and noise level of noise and is outputted as noise data 101,

[supervising the source of noise optically simultaneously and outputting / in quest of the distance to the source of noise, output as ranging data 102, / image data 103 by a pulse laser,]

With pulse laser ranging part 13, surveillance camera part 14, gimbal part 15, and picture tailing treating part 16 which constitute ranging, the measurement of angle, and the image data output means which follows the source of noise automatically according to a gimbal mechanism, and outputs the forward-and-backward inclination angle over the source of noise, and an angle of direction as measurement-of-angle data 105

With data processing part 17 as a data processing means which processes the data for the measure against noise which considers the noise data mentioned above, ranging data and measurement-of-angle data, and image data as an input, and in which the time course of the position of the source of noise and a noise level is shown for record

It has control part 18 as a control means which controls systemwide operation.

[0015]

Next, operation of this example is explained.

[0016]

The mobile noise supervising system of this example shown in Fig. 1 is arranged near the approach to the runway of an airport.

[0017]

Fig. 2 is a top view showing an example of employment deployment of the embodiment of Fig. 1.

In figure 2, a penetration airplane descends for the purpose of landing line L1 to runway S along approach L0, receiving the directions from

a control tower, and stops by stop line L2.

mobile noise supervising system isinstalled in installed position P near the approach L0, and the surveillance of the mobile source of noise by a penetration airplane is carried out as follows by making into an automatic tailing field the space region determined by theta set up beforehand.

[0018]

Surveillance camera part 13 which carries pulse laser ranging part 13, and this and an optic axis in gimbal part 15 which carries out the mark law of the spatial position of a penetration airplane according to a biaxial balance mechanism as parallel is set up in the direction of a penetration end of the automatic tailing field specified by theta mentioned above in an initial inclination position.

surveillance camera part 13 is an image pickup camera using a CCD camera, and sends out image data 103 picturized when the penetration airplane was caught in the euphotic view to picture tailing treating part 16.

[0019]

Picture tailing treating part 16 asks for the gap with the position of a penetration airplane and picture center (acceptance surface center) in inputted image data 103.

Control/drive signal 104 for carrying out the control drive of biaxial [of the X axis of gimbal part 15 and the Y axis] that this gap should be made zero is generated, and a penetration airplane is controlled by this so that at least fortunelling always does the image pick center of surveillance camera part 14.

[0020]

Pulse laser ranging part 13 is a ranging device which uses laser safe for eyes with long wavelength rather than YAG laser or a helium neon gas laser.

The distance to the thing mark can be measured in an instant, what is called an eye-safe laser position finder currently used in various employment fields is used, it points to the same direction as the inclination direction of surveillance camera part 14, ranging to a penetration airplane is performed, and ranging data 102 is sent out to data processing part 17.

[0021]
The optical axis direction of pulse laser ranging part 13 and surveillance camera part 14 to which it points from gimbal 15 again with control/drive signal 104 offered from picture tailing treating part 16,
Namely, it sends out to picture tailing treating part 16 by using as measurement-of-angle data 105 the forward-backward inclination angle and angle of direction which determine the space direction of a penetration airplane.

Ranging data 102 and measurement-of-angle data 105 which were mentioned above determine the spatial position of a penetration airplane.

[0022]
From picture tailing treating part 16, measurement-of-angle data 105 and image data 103 are supplied to data processing part 17 as the measurement of angle / image data 106 in a predetermined data format, respectively.

[0023]
Now, acoustic sensor part 11 asks for the level and arrival direction of noise which the mobile source of noise in an automatic tailing field always emits with source-of-noise judgment part 12, and supplies them to data processing part 17 as noise data 101.

[0024]
Four directive microphones b1 and b2 which have directivity with ahead sharp noise sensor part 11, b3, and b4 are arranged so that at least fortune-telling may do a square vertex, respectively, and indirectional microphone a1 is arranged focusing on arrangement.
The arrangement state of acoustic sensor part 11is shown in figure 3.

[0025]
This acoustic sensor part 11 takes into consideration the automatic tailing field set up beforehand and the penetration direction of a known airplane beforehand, and is placed in a fixed position towards a directive effe in measurement.
It is presented that the output is supplied to source-of-noise judgment part 12 as received signal 111, indirectional microphone a judges the noise level of a penetration airplane, and directive microphones b1-b4 judge the arrival direction of noise.

[0026]

When the output corresponding to the direction of the arrival noise from the automatic tailing field which is a noise measurement landver is generated, respectively, for example, the whole carries out a right opposite to the source of noise, the output of directive microphones b1b4 is mutually equal.
The arrival direction of the source of noise can be known based on , therefore the output difference of four microphones.
[0027]
[this example] in this way although acoustic sensor part 11 is placed in a fixed position
The target mobile [this] is an airplane, it is an employment form based on penetration and the takeoff direction being beforehand set up including tolerance, and, as for a usual state, it is possible also to make subject tailing perform so that the output of four microphones may serve as zero depending on the employment purpose.
[0028]
the position mark of a mobile exact in this example the law is secured by gimbal tailing by the combined use withpulse laser ranging and a surveillance camera, as mentioned above, and the accuracy of the noise arrival directions by acoustic sensor part 11 and source-of-noise judgment part 12 itself does not require a remarkably high thing.
[0029]
Data processing part 17 inputs noise data 101 in which the level and direction of the noise which the penetration airplane as the mobile source of noise emits are shown from source-of-noise judgment part 12.
From pulse laser ranging part 13 and picture tailing treating grp 16, ranging data 102, and the measurement of angle/image data 106 which shows the spatial position of a penetration airplane is inputted, respectively.
The image data of the data to which the spatial position and noise level about a penetration airplane were made to correspond, its time progress, and a penetration airplane is recorded automatically as noise basic data.
The direction information on the noise which noise data 101 includes in this case was compared with the direction information by a highly precise angle, and has secured the bearing accuracy of this system rather than based on measurement-of-angle data 105.